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(54) **VACUUM ENABLED ARTICLE TRANSFER**

VAKUUMAKTIVIERTE ÜBERTRAGUNG VON GEGENSTÄNDEN

TRANSFERT D'ARTICLE PAR LE VIDE

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EP 3 140 045 B1

Description

BACKGROUND OF THE INVENTION

[0001] After applying a material, such as a hot-melt adhesive, to an article, the article may need to be transferred to another process or mechanism. However, a conveyance mechanism (e.g., traditional gravity aided conveyor belt) that contacts a surface (e.g., article bottom surface) to which the material was applied may interfere with the intended coverage of the material. The conveyance mechanism may also become coated in the material as the material transfers from the article to the conveyance mechanism, which can lead to inefficiencies in material usage and down time of the conveyance mechanism.

[0002] EP 1 155 983 A1 describes a stacking device for plates, wherein the plates are conveyed to a suction conveyor which lifts the plates towards a first stacking table at which a release unit allows the plates to fall. A second table is then used with a second release unit.

[0003] US 4 291 974 A describes an apertured vacuum belt document handling system for a copier, with a normal vacuum transport mode for moving the belt with a document thereon over the exposure position, the belt is provided with an unapertured area, preferably larger than the exposure area. This unapertured area is automatically positioned and stopped over the exposure station when the copier is placed in a manual document placement mode of operation.

SUMMARY OF THE INVENTION

[0004] The invention is defined by the independent claims, while preferred embodiments form the subject of the dependent claims.

[0005] Embodiments of the present invention relate to systems and methods for applying a material to an article using a vacuum enabled article transfer mechanism. A belt having a plurality of apertures extending there through is effective to pass a vacuum pressure from a vacuum chamber through the belt to an article to be conveyed. The belt moves relative to the vacuum chamber such that as the article is temporarily adhered to the belt, the article is conveyed. The vacuum enabled article transfer apparatus includes a conveyance belt having a plurality of apertures extending through a contacting surface to an opposite inner surface of the conveyance belt; a compression roller; a second roller, wherein the conveyance belt forms a continuous loop around the compression roller and the second roller such that the belt inner surface is in contact with the compression roller and the second roller; and a vacuum distribution chamber, the chamber positioned between the compression roller and the second roller within the loop of the conveyance belt, wherein the chamber is comprised of an engagement surface proximate the belt inner surface and effective for directing a vacuum pressure through the belt

at the plurality of apertures.

[0006] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWING

[0007] Illustrative embodiments of the present invention are described in detail below with reference to the attached drawing figures, which are incorporated by reference herein and wherein:

FIG. 1 depicts a system having an exemplary vacuum enabled article transfer apparatus, in accordance with aspects hereof;

FIG. 2 depicts an exemplary cross-sectional perspective of a system, such as the system of FIG. 1, in accordance with aspects hereof;

FIG. 3 depicts a focused cross-section of the vacuum chamber, the compression roller, and the conveyance belt, in accordance with aspects hereof;

FIG. 4 depicts a cross section along cut line 4-4 of FIG. 2, in accordance with aspects hereof;

FIG. 5 depicts an isometric perspective of the vacuum chamber, in accordance with aspects hereof;

FIG. 6 depicts the front face of the vacuum chamber, in accordance with aspects hereof;

FIG. 7 depicts a cross section of the vacuum chamber extending from the front face to a back face, in accordance with aspects hereof; and

FIG. 8 depicts a flow diagram illustrating a method for transferring an article using at least a vacuum enabled article transfer apparatus, in accordance with aspects hereof.

DETAILED DESCRIPTION OF THE INVENTION

[0008] The subject matter of embodiments of the present invention is described with specificity herein to meet statutory requirements. However, the description itself is not intended to limit the scope of this patent, which is defined in the appended claims. Rather, the inventors have contemplated that the claimed subject matter might also be embodied in other ways, to include different steps or combinations of steps similar to the ones described in this document, in conjunction with other present or future technologies.

[0009] Aspects herein are directed to a vacuum enabled article transfer apparatus that includes a conveyance belt having a plurality of apertures extending through a contacting surface to an opposite inner surface of the conveyance belt. The apertures allow for the flow of air through the belt such that when a negative pressure (i.e., vacuum) is applied to the inner surface of the belt,

the negative pressure causes a flow of air through the belt. This negative pressure is effective to temporarily adhere an article to the belt while the vacuum is applied to the belt relative to the article. The vacuum enabled article transfer apparatus also includes a compression roller and a second roller. The conveyance belt forms a continuous loop around the compression roller and the second roller such that the belt inner surface is in contact with the compression roller and the second roller. The vacuum enabled article transfer apparatus also has a vacuum distribution chamber. The chamber is positioned between the compression roller and the second roller within the loop of the conveyance belt. The chamber is comprised of an engagement surface proximate the belt inner surface and effective for directing a vacuum pressure through the belt at the plurality of apertures. In combination, the elements of the vacuum enabled article transfer apparatus allows for a conveyance of an article by contacting a surface on which the applied material was not applied.

[0010] FIG. 1 depicts a system 100 having an exemplary vacuum enabled article transfer apparatus 102, in accordance with aspects hereof. In particular, vacuum enabled article transfer apparatus 102 is comprised of a conveyance belt 104, a compression roller 112, a second roller 116, and a vacuum chamber 120. Not depicted in FIG. 1, but contemplated, the vacuum enabled article transfer apparatus 102 may also be comprised of a vacuum source (e.g., vacuum generator) in fluid communication with the vacuum chamber 120.

[0011] The conveyance belt 104 is flexible material, such as silicone, formed into a loop. The conveyance belt is comprised of a contacting surface 110 and an inner surface 108. The contacting surface 110 is outward facing such that an article that is intended to be conveyed by the conveyance belt 104 is in contact with the contacting surface 110. The contacting surface, in an exemplary aspect, may be treated with one or more surface treatments (e.g., ant-stick) to provide a suitable surface for repeated contact with one or more articles. The inner surface 108 is inwardly facing such that the inner surface 108 contacts the compression roller 112 and the second roller 116.

[0012] The conveyance belt 104 is comprised of a plurality of apertures 106 extending through the conveyance belt 104. For example, each of the plurality of apertures 106 extend through the inner surface 108 and the contacting surface 110 such that a vacuum pressure introduced proximate the inner surface 108 is fluidly communicated through the conveyance belt 104 to an article proximate (e.g., near) the contacting surface 110. The plurality of apertures 106 may be any size (or combination of sizes), any shape (or combination of shapes), and in any configuration (or combination of configurations). In an exemplary aspect, it is contemplated that an aperture of the plurality of apertures 106 is circular in shape and has a diameter within a range of 2 mm to 14 mm that are arranged in a repeating and substantially regular pattern

with a first row (or column) offset from a second row (or column). However, it is contemplated that any combination of size, shape, and configuration may be implemented in aspects hereof.

[0013] The conveyance belt 104 forms a loop around at least the compression roller 112 and the second roller 116. A void is formed between the compression roller 112 and the second roller 116 and also between an upper portion and a lower portion of the conveyance belt 104. Within this void, the vacuum chamber 120 may be positioned. As will be discussed in greater detail, it is contemplated that the vacuum chamber 120 may be positioned such that at least a first side 126 extends along (e.g., tangentially) the compression roller 112 such that an engagement surface 122 of the vacuum chamber 120 is positioned close to a location at which the conveyance belt 104 breaks contact with the compression roller 112.

[0014] The vacuum chamber 120 structural components (e.g., engagement surface 122, inlet 124, first side 126, and top surface 128) will be discussed in greater detail hereinafter, such as in connection with FIGS. 3, 5, and 6.

[0015] The compression roller 112 has an axis of rotation 114 and the second roller has an axis of rotation 118. FIG. 1 does not depict a structure supporting and maintaining the components of the vacuum enabled article transfer apparatus 102 in order to illustrate their relative placement; however, one of ordinary skill can appreciate that one or more structural members may be implemented to maintain a location and relative position of the various components discussed herein. For example, a structural member may extend between the axis of rotation 114 and the axis of rotation 118 to maintain a desired tension on the conveyance belt 104, for example. Also not depicted but contemplated, a drive components (e.g., motor and control) operable for moving the conveyance belt 104 around the compression roller 112 and the second roller 116, in an exemplary aspect.

[0016] The system 100 is also comprised of an adhesive applicator 200, in the depicted exemplary aspect. While the term "adhesive" is used in the following discussion of applicator 200, it is contemplated that the applicator 200 may be effective for applying any surface treatment (e.g., water repellant, sealant, dye, paint, and the like). Therefore, while an adhesive is discussed in specific aspects herein, it is contemplated that other surface treatments may alternatively be applied.

[0017] The adhesive applicator 200 is comprised of an adhesive vessel 202 and an applicator roller 204. It is contemplated that the applicator roller is effective to pass through a material (e.g., adhesive) that is maintained within the adhesive vessel 202 such that as an article is passed over and in contact with the applicator roller 204, the material is transferred to the contacting surface of the article. For example, it is contemplated that the adhesive containing vessel may contain an adhesive (e.g., hot melt, heat activated) that temporarily resides on a surface of the applicator roller 204 as the applicator roller

204 spins through the adhesive. This allows the adhesive to be transported out of the adhesive containing vessel 202 and to be applied to a surface of an article, such as an article used in the formation of an article of footwear (e.g., shoe).

[0018] The applicator roller 204, which may be formed from a metallic material, may be heated in an exemplary aspect. The thermal energy from the applicator roller 204 in this example may be effective for maintaining a hot-melt adhesive material in a non-cured state such that the adhesive material may be transferred to the article. It is further contemplated that the adhesive applicator 200 may be comprised of drive components (not illustrated) effective to rotate the applicator roller 204. Further, it is contemplated that a heat generating component may also be included that is effective for maintaining the temperature of the material at or above a melting temperature, such as within a range of 75 to 240 degrees Celsius, in an exemplary aspect.

[0019] The system 100 is also comprised of a plurality of filaments 206. The plurality of filaments may be formed from any suitable material, such as a metallic material. The plurality of filaments 206 may extend across the applicator roller 204 providing a surface plane to effectively guide an article over a surface of the applicator roller 204. Additionally, it is contemplated that the plurality of filaments 206 are effective for dislodging (or ensuring dislodgement) of an article from the surface of the applicator roller 204 after applying the material. The plurality of filaments, in an exemplary aspect, may be heated by an energy source 208 such that a hot-melt adhesive is maintained above a melting temperature on the plurality of filaments 206, which may reduce a buildup of the hot-melt adhesive thereon.

[0020] It is contemplated that the plurality of filaments 206 may extend in a plane substantially parallel with a plane in which the conveyance belt 104 extends between the compression roller 112 and the second roller 116. It is further contemplated that the plurality of filaments 206 may extend away from the conveyance belt 104 following the start of the vacuum chamber 120 after the compression roller 112. In this example, the vacuum enabled article transfer apparatus 102 is effective for conveying and supporting the article without the assistance of the plurality of filaments 206. Separating the article from the filaments while still conveying the article by the vacuum enabled article transfer apparatus 102 may be advantageous in aspects to allow the applied material (e.g., hot-melt adhesive) to cure (e.g., cool) without the physical contact of a bottom-supporting plurality of filaments 206.

[0021] The system may also be comprised of a secondary conveyance 209, in an exemplary aspect. For example, the secondary conveyance may transport an article following the conveyance of the vacuum enabled article transfer apparatus 102. For example, the vacuum enabled article transfer apparatus 102 may convey (or maintain) the article for a sufficient time to allow the applied material to cure to a degree that the applied material

on the article may be contacted by a surface of the secondary conveyance 209. In an exemplary aspect, the secondary conveyance is a belt-like structure that has an anti-stick characteristic.

[0022] FIG. 2 depicts an exemplary cross-sectional perspective of a system, such as the system 100 of FIG. 1, in accordance with aspects hereof. The system of FIG. 2 is comprised of the vacuum enabled article transfer apparatus 102 and the adhesive applicator 200 discussed in FIG. 1. Similarly numbered elements of FIG. 2 relate to the corresponding elements discussed with respect to FIG. 1.

[0023] Specifically depicted in FIG. 2 is a vacuum source 308 that is fluidly coupled/connected by way of connector 310 with the vacuum chamber 120. The vacuum source 308 may be any vacuum source, such as an electrically driven, pneumatic driven, and/or hydraulic driven generator of vacuum pressure, a negative (reduced) pressure relative to atmospheric pressure. The connector 310 is illustrated for exemplary purposes and is not limiting in nature. It is contemplated that the connector may be of any size, shape, and/or position.

[0024] As depicted, the conveyance belt 104 and the engagement surface of the vacuum chamber 120 are in a contacting relationship, in the illustrated example. This contacting relationship allows for a seal-like bond to occur between the sliding conveyance belt 104 and the vacuum chamber 120 to ensure a sufficient amount of vacuum pressure is transferred through the belt 104 to the article 306 when being conveyed. If a gap existed between the conveyance belt 104 and the vacuum chamber 120, an insufficient amount of vacuum pressure may be transmitted through the conveyance belt 104 to effectively adhere the article 306 to the belt for conveyance, in an exemplary aspect.

[0025] The adhesive containing vessel 202 is depicted containing a material 302, such as a hot-melt adhesive. The applicator roller 204 rotates through the material 302 such that a portion of the material 302 is transferred on the surface of the applicator roller 204 to an article, such as an article 306, as the article passes between the applicator roller 204 and the compression roller 112. To achieve a controlled exit of the article and an even application of material on to the article from between the compression roller 112 and the applicator roller 204, it is contemplated that a plane passing through the axis of rotation 114 and an axis of rotation 304 is aligned perpendicular to a plane defined by the conveyance belt 104 extending between the compression roller 112 and the second roller 116, in an exemplary aspect.

[0026] Said plane extending between the axis of rotations for the compression roller 112 and the applicator roller 204 is also identified as cutline 4-4, which represents a cross sectional perspective for FIG. 4 hereinafter. Also, a highlighted region is depicted around the vacuum chamber 120 and the compression roller 112, which is magnified in FIG. 3 hereinafter.

[0027] FIG. 3 depicts a focused cross-section of the

vacuum chamber 120, the compression roller 112, and the conveyance belt 104, in accordance with aspects hereof. Similarly numbered elements of FIG. 3 relate to the corresponding elements discussed with respect to FIGS. 1 and 2.

[0028] FIG. 3 depicts the vacuum chamber 120 extending between the compression roller 112 and the conveyance belt 104 proximate a location where the conveyance belt 104 separates from contacting the compression roller 112. For example, the vacuum chamber 120 extends between the compression roller 112 and the belt 104 a lateral distance represented by distance 316, which is measured from a vertical tangent 312 to the intersection of the engagement surface 122 and the first side 126. The distance 316 enhances the ability of the vacuum chamber 120 to acquire and adhere to the article following the application of a material (e.g., hot-melt adhesive). An acute angle 320 is formed between the engagement surface 122 and the first side 126. The acute angle allows for the vacuum chamber 120 to extend a greater distance 316 than a vacuum chamber having a similar height with a less acute angle, which aids in the acquisition of the article by the vacuum chamber 120, in an exemplary aspect.

[0029] Additionally depicted in FIG. 3, a diameter 318 of the compression roller 112 is greater than a height 314 of the vacuum chamber 120. This difference in height allows at least a portion of the vacuum chamber 120 to be positioned between a top portion and a bottom portion of the loop formed by the conveyance belt 104. This allows the vacuum chamber to remain stationary as the conveyance belt is operable to rotate (e.g., move) around the vacuum chamber. In this manner, potential complications with moving the vacuum source and/or vacuum chamber 120 may be avoided by instead moving the conveyance belt around the fixed vacuum chamber 120 to move an article.

[0030] FIG. 4 depicts a cross section along cut line 4-4 of FIG. 2, in accordance with aspects hereof. Similarly numbered elements of FIG. 4 relate to the corresponding elements discussed with respect to FIGS. 1 and 2.

[0031] The conveyance belt 104 is depicted having the plurality of aperture 106 extending through both the contacting surface 110 and the inner surface 108. As such, it is contemplated that a vacuum pressures experienced proximate the inner surface 108 transfers through the belt 104 to an article near the contacting surface 110.

[0032] The applicator roller 204 is depicted having a plurality of grooves 406 effective to receive and maintain the plurality of filaments 206. The grooves 406 allow for recesses of the filaments 206 such that an outer surface 408 of the applicator roller 204 extends beyond the filaments 206 as recessed in the grooves 406. The extension of the outer surface 408 allows contact between the applicator roller 204 and the article to occur with limited interference from the filaments 206. Stated differently, without the outer surface 408 extending beyond the plurality of filaments 206 at the applicator roller 204, an ef-

fective transfer of material (e.g., hot-melt adhesive) may not occur between the applicator roller 204 and the article, in an exemplary aspect.

[0033] A compression height 410 is depicted as extending between the contacting surface 110 of the conveyance belt 104 and the outer surface 408 of the applicator roller 204. The compression height 410 may be adjusted by raising/lowering one or more of the elements provided herein. In an exemplary aspect, the compression height 410 is from 85% to 100% a thickness of the article to be passed there through. Stated differently, it is contemplated that the compression height 410 is within 15% the height of an article onto which a material is to be applied. This compression height 410 allows a desired amount of compression to be applied to the article to ensure an appropriate and sufficient application of material is achieved.

[0034] While FIG. 4 illustrates exemplary configurations of elements, it is understood that any configuration, size, shape, and relative position may be used. For example, while the grooves 406 are depicted as being uniform in nature, it is contemplated that a higher concentration of grooves may be positioned in a primary working zone, in an exemplary aspect. Further, while an exemplary size, shape, and position of the apertures 106 are depicted, it is contemplated that alternative may be implemented. Further, while a width of the compression roller 112 and the applicator roller 204 are depicted as being substantially similar, it is contemplated that different widths and sizes may be implemented.

[0035] FIG. 5 depicts an isomeric perspective of the vacuum chamber 120, in accordance with aspects hereof. Similarly numbered elements of FIG. 5 relate to the corresponding elements discussed with respect to FIG. 1. The vacuum chamber 120 is comprised of the top surface 128, the first side 126, the engagement surface 122, the inlet 124, and a front face 502. The inlet 124 serves as a connection port for fluidly coupling an internal volume of the vacuum chamber 120 with a vacuum source. It is contemplated that additional inlets may be implemented to allow for the coupling or distribution of additional vacuum pressure. Also depicted in FIG. 5 is a cut line 7-7 that will represent the cross section of FIG. 7 hereinafter.

[0036] FIG. 6 depicts the front face 502 of the vacuum chamber 120, in accordance with aspects hereof. In particular, FIG. 6 highlights a trapezoidal configuration of the front face 502 that is effective to extend the engagement surface 122 between the compression roller 112 and the conveyance belt of FIG. 2. The trapezoidal shape of the front face 502 is also effective, in an exemplary aspect, to extend engagement surface 122 between the second roller 116 and the conveyance belt 104 of FIG. 2. While the first side 126 and a second side 608 are depicted as being linear in nature, it is contemplated that an arc or curve may be applied to better conform to the contours of the respective proximal rollers of each side. The formation of the trapezoidal front face 502 results in

obtuse angles 602 and 604 as well as acute angles 606 and 320. As previously discussed, the acute angles 320 and 606 may allow for a greater inclusion of the engagement surface 122 between a roller and the conveyance belt to increase an area of the conveyance belt for which vacuum pressure is applied/transmitted.

[0037] FIG. 7 depicts a cross section of the vacuum chamber 120 extending from the front face 502 to a back face 504, in accordance with aspects hereof. FIG. 7 depicts an internal volume 7006 that is substantially bounded by the top surface 128, the front face 502, the back face 504, the second side 608, the first side 126 (not depicted in the cut view), and the engagement surface 122. As depicted, the engagement surface is expanded with an extension 702 from the front face 502 and an extension 704 from the back face 504. The extensions 702 and 704 may extend from the respective faces any length to result in an engagement surface aperture 708 through which vacuum pressure is transferred through a conveyance belt. For example, if a conveyance belt is narrower than the width between the front face 502 and the back face 504, the extensions 702 and/or 704 may be formed to concentrate that engagement surface aperture 708 over a serviceable portion of the conveyance belt, in an exemplary aspect. Further, it is contemplated that the extensions 702 and 704 may be omitted altogether, such as when the front face 502 and the back face 504 have a separation approximate that of a serviceable region of an underlying conveyance belt.

[0038] FIG. 8 depicts a flow diagram 800 illustrating a method for transferring an article using at least a vacuum enabled article transfer apparatus, in accordance with aspects hereof. At a block 802, a step of compressing an article between a compression roller and an applicator roller is provided. For example, it is contemplated that an article, such as a portion of material to use in the formation of an article of apparel or footwear may be fed between counter rotating compression roller and applicator roller having a compression height equal to or less than the thickness of the article. The counter rotation of the spaced apart rollers is effective to move the article between the rollers.

[0039] At a block 804, a step of applying a material to a first side of the article is provided. For example, it is contemplated that the applicator roller of block 802 is a carrier of the material, such as a hot-melt. Such that the compression of the article in block 802 aids in a transfer of material from the applicator roller to the article such that the material is applied to the surface of the article in contact with the applicator roller.

[0040] At a block 806, a step of temporarily adhering, with vacuum pressure, the article to a belt is provided. For example, when vacuum pressure is applied within a vacuum chamber that is in fluid communication with a belt having apertures extending through the belt, the vacuum pressure passes through the belt to the article to create a negative pressure attraction force effective for adhering the article to the belt. This adhesion is tempo-

rary in that the adhesion is effective only while the negative pressure is applied through the belt. Therefore, as the belt moves out of a region supplying the vacuum pressure or as the vacuum pressure is removed, the adhesion of the article to the belt is also eliminated.

[0041] At a block 808, a step of moving the belt from a first position to a second position while maintaining the vacuum adhesion between the belt and article is provided. For example, as a belt slidably traverses a vacuum pressure zone, such as one provided by a vacuum chamber, the article moves from a first position to a second position. This movement may allow the entirety of the article to have material applied to the first side, as provided in block 804 while limiting contact of the first side with a supporting structure as the article moves.

[0042] At a block 810, a step of moving the belt from the second position to a third position such that the vacuum adhesion adhering the article to the belt is insufficient to maintain the adhesion at the third position. For example, as the belt slides beyond a vacuum pressure region of a vacuum chamber, a vacuum pressure sufficient to adhere the article to the belt is no longer present. At the third position, the belt is no longer sufficient for conveying the article as the article is no longer adhered to the belt.

[0043] At a block 812, a step of transferring the article to a secondary transportation mechanism is provided. The secondary transportation mechanism may be a conveyance belt that contacts the first side of the article. However, the vacuum enabled article transfer apparatus may have maintained the article for a time sufficient to limit the transfer of applied material from the article to the second transportation mechanism, in an exemplary aspect.

[0044] While specific reference in FIG. 8 is made to one or more steps, it is contemplated that one or more additional or alternative steps may be implemented while achieving aspects provided herein. As such, blocks may be added or omitted while still staying within the scope hereof.

[0045] From the foregoing, it will be seen that this invention is one well adapted to attain all the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

[0046] It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. The scope of the invention is defined in the claims.

[0047] While specific elements and steps are discussed in connection to one another, it is understood that any element and/or steps provided herein is contemplated as being combinable with any other elements and/or steps regardless of explicit provision of the same while still being within the scope provided herein. Since many possible embodiments may be made of the disclosure without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the

accompanying drawings is to be interpreted as illustrative of the invention, which is defined in the appended claims, and not in a limiting sense.

Claims

1. A vacuum enabled article transfer apparatus (102), the apparatus (102) comprising:

a conveyance belt (104) having a plurality of apertures (106) extending through a contacting surface (110) to an opposite inner surface (108) of the conveyance belt (104);
 a compression roller (112);
 a second roller (116), wherein the conveyance belt (104) forms a continuous loop around the compression roller (112) and the second roller (116) such that the belt inner surface (108) is in contact with the compression roller (112) and the second roller (116); and
 a vacuum distribution chamber (120), the chamber (120) positioned between the compression roller (112) and the second roller (116) within the loop of the conveyance belt (104), wherein the chamber (120) is comprised of an engagement surface (122) proximate the belt inner surface (108) and effective for directing a vacuum pressure through the belt (104) at the plurality of apertures (106);
characterized in that the apparatus further comprises:

an adhesive applicator (200), the applicator (200) comprising an applicator roller (204) and an adhesive containing vessel (202), the applicator roller (204) rotatably positioned at least partially within the adhesive containing vessel (202), wherein the adhesive applicator (200) further comprising a plurality of transfer filaments (206), the transfer filaments (206) extending between the applicator roller (204) and the belt (104).

2. The vacuum enabled article transfer apparatus (102) of claim 1, wherein the compression roller (112) has a diameter (318) that is greater than a height (314) of the chamber (120) within the loop formed by the belt (104).
 3. The vacuum enabled article transfer apparatus (102) of claim 1 further comprising a vacuum generator fluidly coupled with the chamber (120).
 4. The vacuum enabled article transfer apparatus (102) of claim 1, wherein the engagement surface (122) of the chamber (120) extends between at least a

portion of the compression roller (112) and the belt (104).

5. The vacuum enabled article transfer apparatus (102) of claim 1, wherein the applicator roller (204) has a diameter greater than a diameter (318) of the compression roller (112).

6. The vacuum enabled article transfer apparatus (102) of claim 1, wherein an axis of rotation (114) of the compression roller (112) and axis of rotation (304) of the applicator roller (204) are substantially aligned in a plane perpendicular to a plane through which the belt (104) extends between the compression roller (112) and the second roller (116).

7. The vacuum enabled article transfer apparatus (102) of claim 1, wherein the transfer filaments (206) are thermally coupled with an energy source (208) such that the transfer filaments (206) are maintained above a threshold temperature, and, optionally, wherein the threshold temperature is a temperature within a range of 75 to 240 degrees Celsius.

8. The vacuum enabled article transfer apparatus (102) of claim 1, wherein the transfer filaments (206) extend, at least partially, in a plane substantially parallel with a plane in which the belt (104) extends between the compression roller (112) and the second roller (116).

9. The vacuum enabled article transfer apparatus (102) of claim 1, wherein the vacuum distribution chamber (120) has a first side (126) that extends from the engagement surface (122) at an acute angle (320) to an upper surface, and, optionally, wherein at least a portion of the first side (126) extends along the compression roller (112) and between compression roller (112) and the belt (104).

10. A method of transferring an article (306), the method comprising:

receiving the article (306) at a position on a vacuum enabled article transfer apparatus (102);
 applying a material (302) to a first side of the article (306);
 temporarily adhering, with a vacuum pressure, the article (306) to a conveyance belt (104), wherein the belt (104) is in contact with a second side of the article (306), the second side is opposite of the first side;
 while maintaining the vacuum adhesion of the article (306) to the belt (104); moving the belt (104) from a first position to a second position;
 moving the belt (104) from the second position to a third position, such that at the third position the vacuum adhesion is insufficient to counter-

- act a force of gravity on the article (306) such that the article (306) is no longer adhered to the belt (104) by vacuum adhesion, wherein an applicator roller (204) applies the material (302) to the first side of the article (306), and wherein the material (302) is an adhesive, wherein the vacuum enabled article transfer apparatus (102) comprises an applicator roller (204) and an adhesive containing vessel (202), the applicator roller (204) rotatably positioned at least partially within the adhesive containing vessel (202), wherein the adhesive applicator (200) further comprises a plurality of transfer filaments (206), the transfer filaments (206) extending between the applicator roller (204) and the belt (104).
11. The method of claim 10, wherein the article (306) is portion of an article of footwear.
12. The method of claim 10, wherein the belt (104) is comprised of a plurality of apertures (106) extending there through for allowing a transfer of vacuum pressure through the belt (104) to the article (306).
13. The method of claim 10 further comprising compressing the article (306) between a compression roller (112) and the applicator roller (204), wherein the compression roller (112) is within a loop formed by the belt (104).
14. The method of claim 10, wherein the third position of the belt (104) is a location beyond a vacuum chamber (120) applying the vacuum pressure.
15. The method of claim 10 further comprising transferring the article (306) from the belt (104) to a secondary transport mechanism, wherein the secondary transport mechanism is in contact with the first side of the article (306).

Patentansprüche

1. Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen, wobei die Einrichtung (102) Folgendes umfasst:
- ein Förderband (104), das eine Vielzahl von Öffnungen (106) aufweist, die sich durch eine Kontaktfläche (110) hindurch zu einer entgegengesetzten Innenoberfläche (108) des Förderbands (104) erstrecken;
- eine Kompressionswalze (112);
- eine zweite Walze (116), wobei das Förderband (104) eine endlose Schleife um die Kompressionswalze (112) und die zweite Walze (116) herum bildet, sodass die Bandinnenoberfläche

(108) in Kontakt mit der Kompressionswalze (112) und der zweiten Walze (116) ist; und eine Vakuumverteilerkammer (120), wobei die Kammer (120) zwischen der Kompressionswalze (112) und der zweiten Walze (116) innerhalb der Schleife des Förderbands (104) positioniert ist, wobei die Kammer (120) aus einer Eingriffsfläche (122) besteht, die sich nahe der Bandinnenoberfläche (108) befindet und wirksam zum Leiten eines Vakuumdrucks an der Vielzahl von Öffnungen (106) durch das Band (104) ist; **dadurch gekennzeichnet, dass** die Einrichtung ferner Folgendes umfasst:

- einen Klebstoffapplikator (200), wobei der Applikator (200) eine Auftragwalze (204) und einen Klebstoff enthaltenden Behälter (202) umfasst, wobei die Auftragwalze (204) zumindest teilweise in dem Klebstoff enthaltenden Behälter (202) drehbar positioniert ist, wobei der Klebstoffapplikator (200) ferner eine Vielzahl von Transferfilamenten (206) umfasst, wobei sich die Transferfilamente (206) zwischen der Auftragwalze (204) und dem Band (104) erstrecken.
2. Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen nach Anspruch 1, wobei die Kompressionswalze (112) einen Durchmesser (318) aufweist, der größer als eine Höhe (314) der Kammer (120) innerhalb der von dem Band (104) gebildeten Schleife ist.
3. Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen nach Anspruch 1, die ferner einen Vakuumerzeuger in Fluidverbindung mit der Kammer (120) umfasst.
4. Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen nach Anspruch 1, wobei sich die Eingriffsfläche (122) der Kammer (120) zwischen mindestens einem Abschnitt der Kompressionswalze (112) und dem Band (104) erstreckt.
5. Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen nach Anspruch 1, wobei die Auftragwalze (204) einen Durchmesser aufweist, der größer als ein Durchmesser (318) der Kompressionswalze (112) ist.
6. Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen nach Anspruch 1, wobei eine Drehachse (114) der Kompressionswalze (112) und eine Drehachse (304) der Auftragwalze (204) im Wesentlichen in einer Ebene ausgerichtet sind, die senkrecht zu einer Ebene ist, über die sich das Band (104) zwischen der Kompressionswalze (112) und

der zweiten Walze (116) erstreckt.

7. Einrichtung (102) zum vakuumgestützten Transfer nach Anspruch 1, wobei die Transferfilamente (206) thermisch mit einer Energiequelle (208) gekoppelt sind, sodass die Transferfilamente (206) oberhalb einer Schwellentemperatur gehalten werden, und, optional, wobei die Schwellentemperatur eine Temperatur innerhalb eines Bereichs von 75 bis 240 Grad Celsius ist. 5
8. Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen nach Anspruch 1, wobei sich die Transferfilamente (206), zumindest teilweise, in einer Ebene erstrecken, die im Wesentlichen parallel zu einer Ebene ist, in der sich das Band (104) zwischen der Kompressionswalze (112) und der zweiten Walze (116) erstreckt. 10
9. Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen nach Anspruch 1, wobei die Vakuumverteilerkammer (120) eine erste Seite (126) aufweist, die sich von der Eingriffs Oberfläche (122) in einem spitzen Winkel (320) zu einer oberen Oberfläche erstreckt, und, optional, wobei sich mindestens ein Abschnitt der ersten Seite (126) entlang der Kompressionswalze (112) und zwischen der Kompressionswalze (112) und dem Band (104) erstreckt. 15
10. Verfahren zum Transferieren eines Gegenstands (306), wobei das Verfahren Folgendes umfasst: 20
 - Empfangen des Artikels (306) an einer Position auf einer Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen; 25
 - Aufbringen eines Materials (302) auf eine erste Seite des Gegenstands (306);
 - vorübergehendes Anhaften, mittels eines Vakuumdrucks, des Gegenstands (306) an ein Förderband (104), wobei das Band (104) in Kontakt mit einer zweiten Seite des Gegenstands (306) ist, wobei die zweite Seite entgegengesetzt zu der ersten Seite ist; 30
 - während des Aufrechterhaltens der Vakuumhaftung von dem Gegenstand (306) an dem Band (104); Bewegen des Bands (104) von einer ersten Position in eine zweite Position; 35
 - Bewegen des Bands (104) von der zweiten Position in eine dritte Position, sodass die Vakuumhaftung an der dritten Position unzureichend ist, um einer Wirkung der Schwerkraft auf den Gegenstand (306) entgegenzuwirken, sodass der Gegenstand (306) nicht länger durch Vakuumhaftung an dem Band (104) anhaftet, wobei eine Auftragwalze (204) das Material (302) auf die erste Seite des Gegenstands (306) 40

aufbringt, und wobei das Material (302) ein Klebstoff ist,

wobei die Einrichtung (102) zum vakuumgestützten Transfer von Gegenständen eine Auftragwalze (204) und einen Klebstoff enthaltenden Behälter (202) umfasst, wobei die Auftragwalze (204) zumindest teilweise in dem Klebstoff enthaltenden Behälter (202) drehbar positioniert ist, wobei der Klebstoffapplikator (200) ferner eine Vielzahl von Transferfilamenten (206) umfasst, wobei sich die Transferfilamente (206) zwischen der Auftragwalze (204) und dem Band (104) erstrecken.

11. Verfahren nach Anspruch 10, wobei der Gegenstand (306) ein Abschnitt eines Schuhartikels ist. 15
12. Verfahren nach Anspruch 10, wobei das Band (104) aus einer Vielzahl von Öffnungen (106) besteht, die sich so durch dieses hindurch erstrecken, dass sie einen Transfer eines Vakuumdrucks durch das Band (104) hindurch auf den Gegenstand (306) ermöglichen. 20
13. Verfahren nach Anspruch 10, das ferner ein Zusammenpressen des Gegenstands (306) zwischen einer Kompressionswalze (112) und der Auftragwalze (204) umfasst, wobei sich die Kompressionswalze (112) innerhalb einer von dem Band (104) gebildeten Schleife befindet. 25
14. Verfahren nach Anspruch 10, wobei die dritte Position des Bands (104) eine Stelle hinter einer Vakuumkammer (120), die den Vakuumdruck anwendet, ist. 30
15. Verfahren nach Anspruch 10, das ferner ein Transferieren des Gegenstands (306) von dem Band (104) auf einen sekundären Transportmechanismus umfasst, wobei der sekundäre Transportmechanismus in Kontakt mit der ersten Seite des Gegenstands (306) ist. 35

Revendications

1. Appareil de transfert d'article par le vide (102), l'appareil (102) comprenant : 45
 - une courroie de transport (104) présentant une pluralité d'ouvertures (106) s'étendant à travers une surface de contact (110) vers une surface intérieure (108) opposée de la courroie de transport (104) ;
 - un rouleau de compression (112) ;
 - un deuxième rouleau (116), dans lequel la courroie de transport (104) forme une boucle 50

continue autour du rouleau de compression (112) et du deuxième rouleau (116), de sorte que la surface intérieure de courroie (108) est en contact avec le rouleau de compression (112) et le deuxième rouleau (116) ; et

- une chambre de distribution de vide (120), la chambre (120) étant positionnée entre le rouleau de compression (112) et le deuxième rouleau (116) à l'intérieur de la boucle de la courroie de transport (104), dans lequel la chambre (120) est composée d'une surface d'engagement (122) à proximité de la surface intérieure de courroie (108) et opérationnelle pour diriger une pression négative à travers la courroie (104) vers la pluralité d'ouvertures (106) ;

caractérisé en ce que l'appareil comprend en outre :

- un applicateur d'adhésif (200), l'applicateur (200) comprenant un rouleau d'applicateur (204) et un récipient contenant de l'adhésif (202), le rouleau d'applicateur (204) étant positionné de façon rotative au moins partiellement dans le récipient contenant de l'adhésif (202),

dans lequel l'applicateur d'adhésif (200) comprend en outre une pluralité de filaments de transfert (206), les filaments de transfert (206) s'étendant entre le rouleau d'applicateur (204) et la courroie (104).

2. Appareil de transfert d'article par le vide (102) selon la revendication 1, dans lequel le rouleau de compression (112) présente un diamètre (318) supérieur à une hauteur (314) de la chambre (120) à l'intérieur de la boucle formée par la courroie (104).
3. Appareil de transfert d'article par le vide (102) selon la revendication 1, comprenant en outre un générateur de vide accouplé fluidiquement à la chambre (120).
4. Appareil de transfert d'article par le vide (102) selon la revendication 1, dans lequel la surface d'engagement (122) de la chambre (120) s'étend entre une partie au moins du rouleau de compression (112) et la courroie (104).
5. Appareil de transfert d'article par le vide (102) selon la revendication 1, dans lequel le rouleau d'applicateur (204) présente un diamètre supérieur à un diamètre (318) du rouleau de compression (112).
6. Appareil de transfert d'article par le vide (102) selon la revendication 1, dans lequel un axe de rotation (114) du rouleau de compression (112) et un axe de rotation (304) du rouleau d'applicateur (204) sont substantiellement alignés dans un plan perpendicu-

laire à un plan à travers lequel s'étend la courroie (104) entre le rouleau de compression (112) et le deuxième rouleau (116).

7. Appareil de transfert d'article par le vide (102) selon la revendication 1, dans lequel les filaments de transfert (206) sont accouplés thermiquement à une source d'énergie (208), de telle façon que les filaments de transfert (206) sont maintenus au-dessus d'une température seuil, et, facultativement, dans lequel la température seuil est une température dans une plage de 75 à 240 degrés Celsius.
8. Appareil de transfert d'article par le vide (102) selon la revendication 1, dans lequel les filaments de transfert (206) s'étendent au moins partiellement dans un plan substantiellement parallèle à un plan dans lequel la courroie (104) s'étend entre le rouleau de compression (112) et le deuxième rouleau (116).
9. Appareil de transfert d'article par le vide (102) selon la revendication 1, dans lequel la chambre de distribution de vide (120) présente un premier côté (126) s'étendant à partir de la surface d'engagement (122) selon un angle aigu (320) vers une surface supérieure, et, facultativement, dans lequel une partie au moins du premier côté (126) s'étend le long du rouleau de compression (112) et entre le rouleau de compression (112) et la courroie (104).
10. Procédé de transfert d'article (306), le procédé comprenant :
 - la réception de l'article (306) à une position sur un appareil de transfert d'article par le vide (102) ;
 - l'application d'un matériau (302) sur un premier côté de l'article (306) ;
 - l'adhérence temporaire, avec une pression négative, de l'article (306) à une courroie de transport (104), la courroie (104) étant en contact avec un deuxième côté de l'article (306), le deuxième côté étant opposé au premier côté ;
 - tout en maintenant l'adhérence sous vide de l'article (306) à la courroie (104) ; le déplacement de la courroie (104) d'une première position vers une deuxième position ;
 - le déplacement de la courroie (104) de la deuxième position vers une troisième position, de telle façon qu'à la troisième position, l'adhérence sous vide est insuffisante pour contrebalancer une force de gravité sur l'article (306), de telle façon que l'article (306) n'adhère plus à la courroie (104) par adhérence sous vide,

dans lequel un rouleau d'applicateur (204) applique le matériau (302) sur le premier

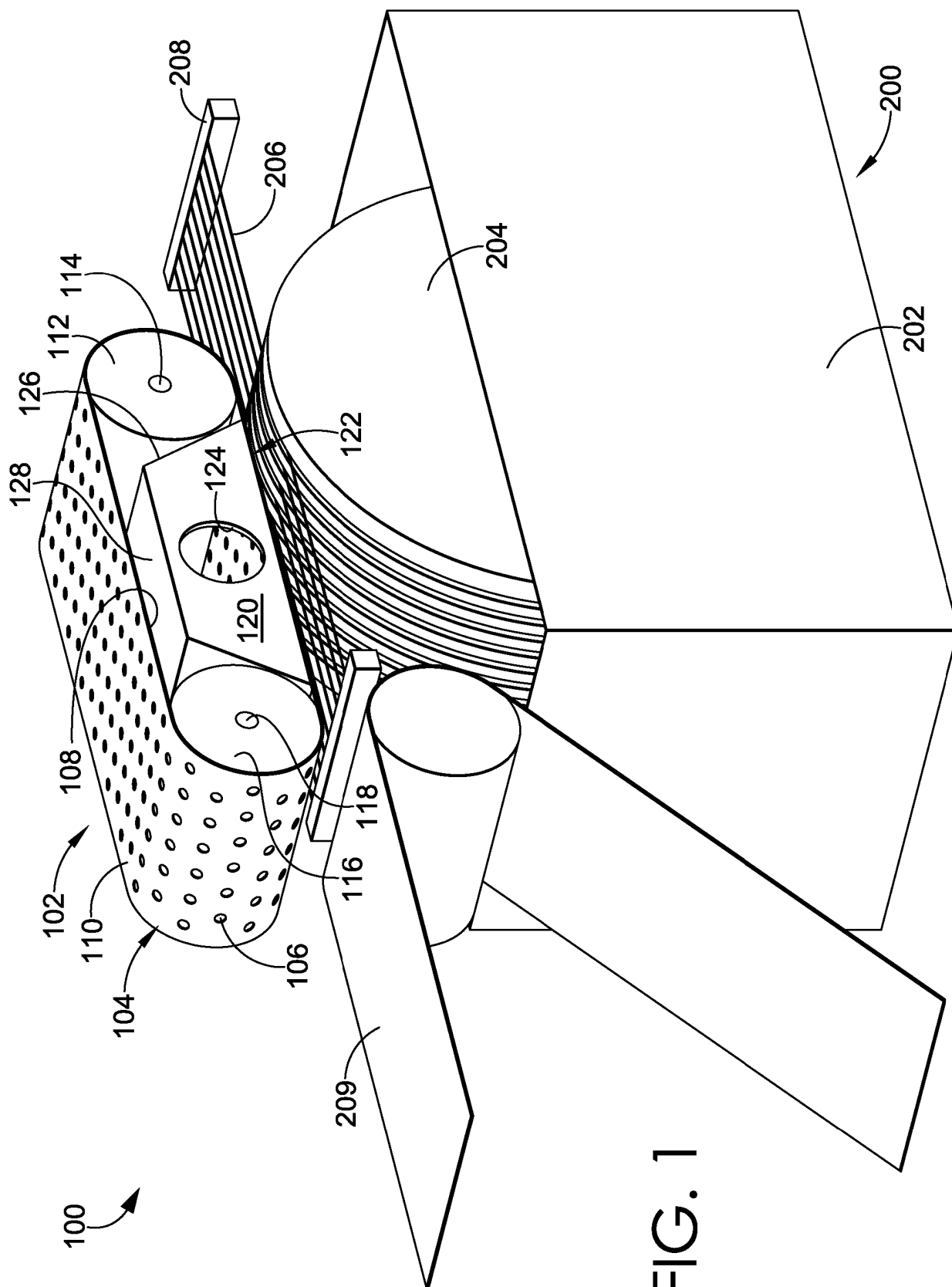
côté de l'article (306), et dans lequel le matériau (302) est un adhésif, dans lequel l'appareil de transfert d'article par le vide (102) comprend un rouleau d'ap-
plicateur (204) et un récipient contenant de l'adhésif (202), le rouleau d'ap-
plicateur (204) étant positionné de façon rotative au moins partiellement dans le récipient con-
tenant de l'adhésif (202), dans lequel l'applicateur d'adhésif (200) comprend en outre une pluralité de fila-
ments de transfert (206), les filaments de transfert (206) s'étendant entre le rouleau d'ap-
plicateur (204) et la courroie (104).

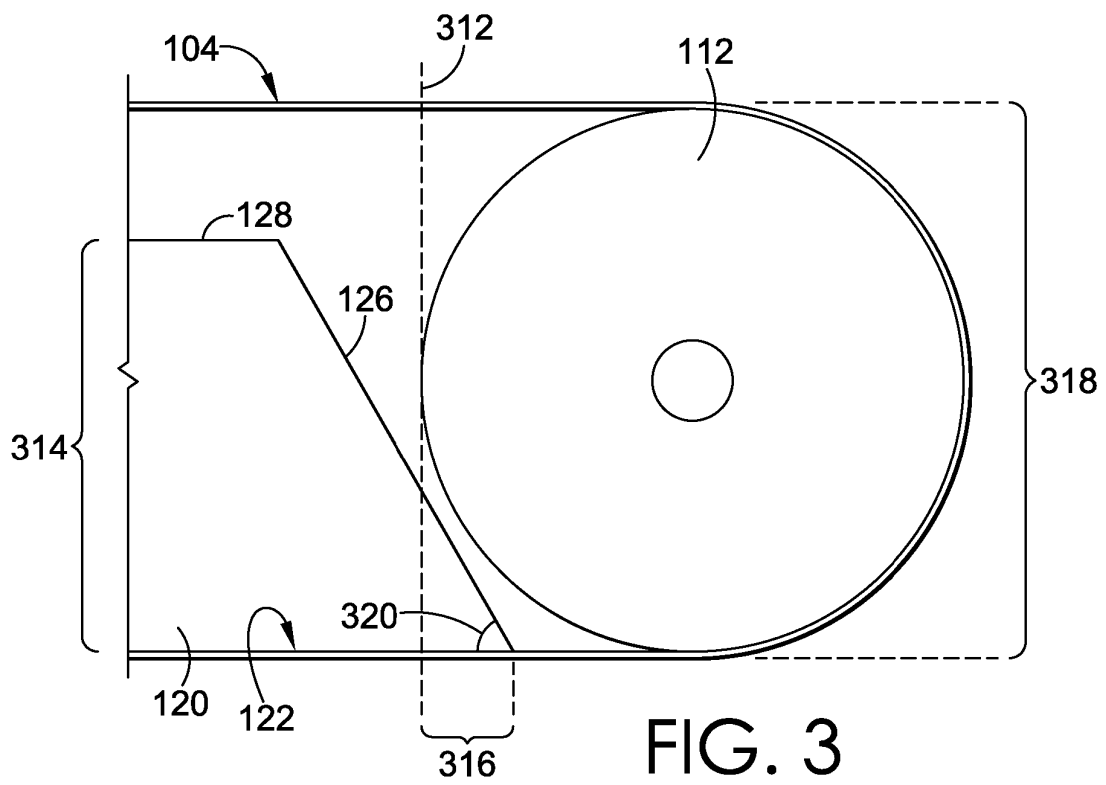
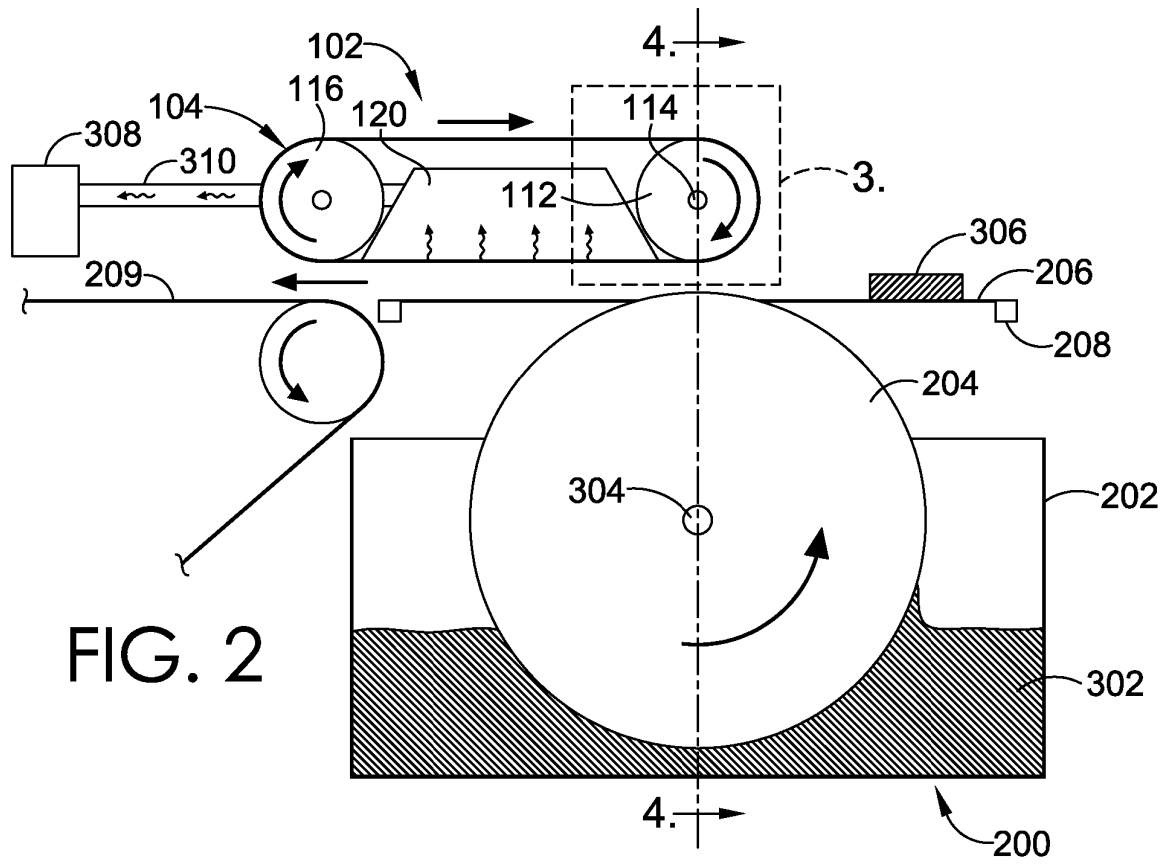
11. Procédé selon la revendication 10, dans lequel l'article (306) fait partie d'un article chaussant.
12. Procédé selon la revendication 10, dans lequel la courroie (104) est composée d'une pluralité d'ouvertures (106) s'étendant à travers celle-ci pour permettre un transfert de pression négative à travers la courroie (104) vers l'article (306).
13. Procédé selon la revendication 10, comprenant en outre la compression de l'article (306) entre un rouleau de compression (112) et le rouleau d'ap-
plicateur (204), le rouleau de compression (112) se trouvant dans une boucle formée par la courroie (104).
14. Procédé selon la revendication 10, dans lequel la troisième position de la courroie (104) est un emplacement au-delà de la chambre à vide (120) appliquant la pression négative.
15. Procédé selon la revendication 10, comprenant en outre le transfert de l'article (306) à partir de la courroie (104) vers un mécanisme de transport secondaire, le mécanisme de transport secondaire étant en contact avec le premier côté de l'article (306).

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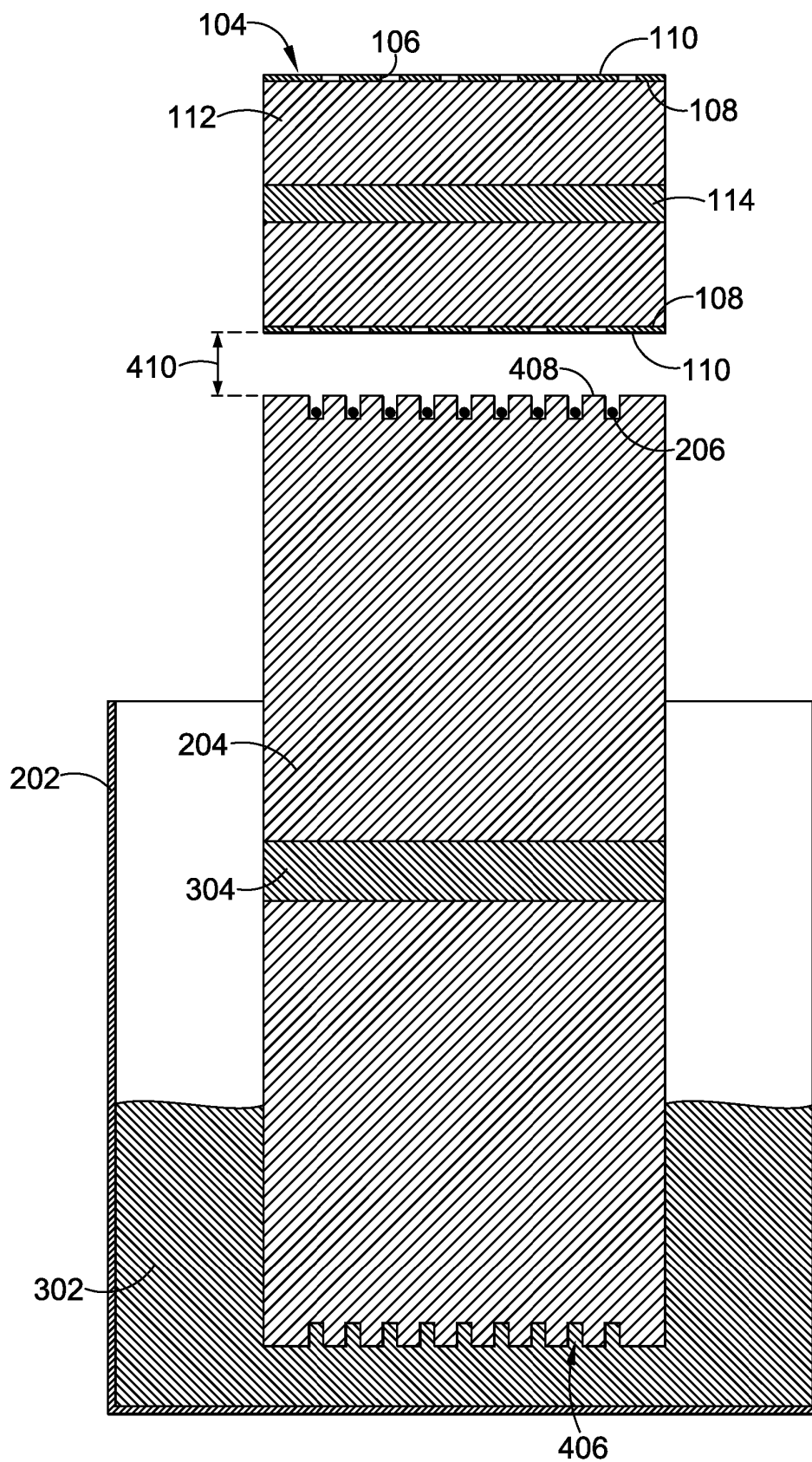
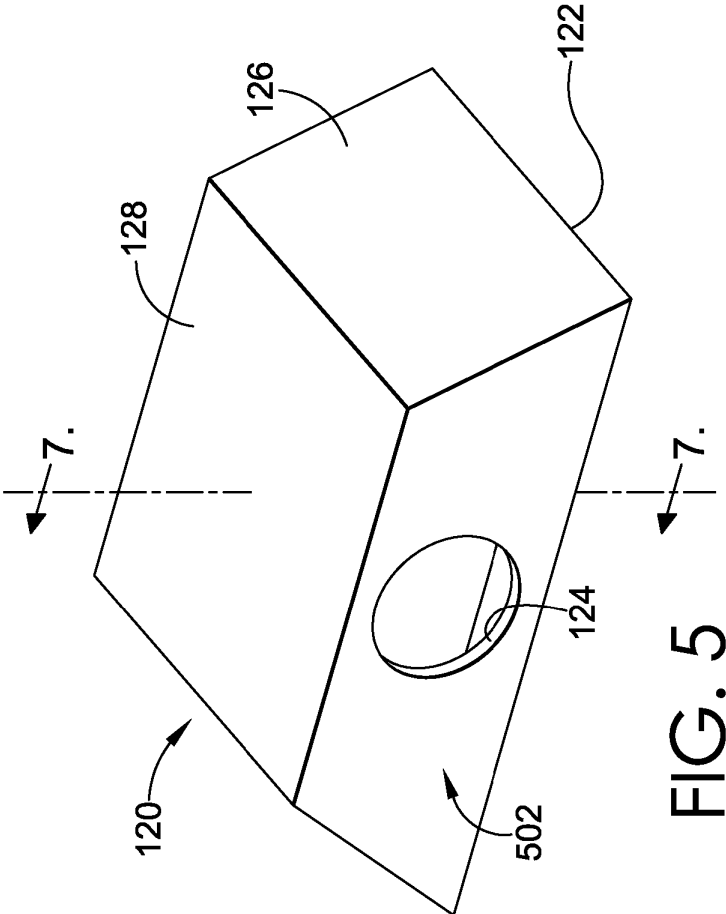
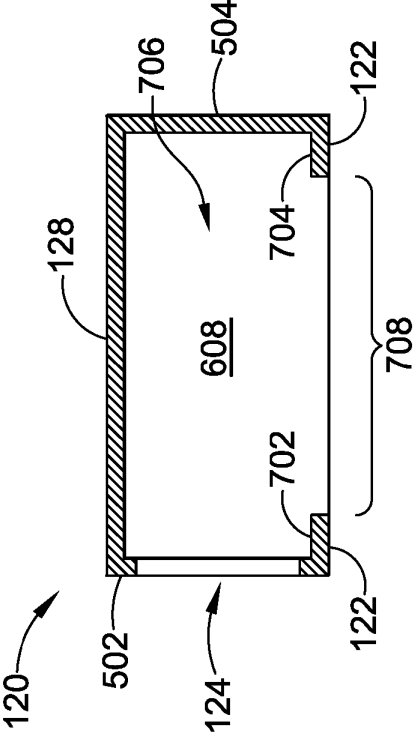
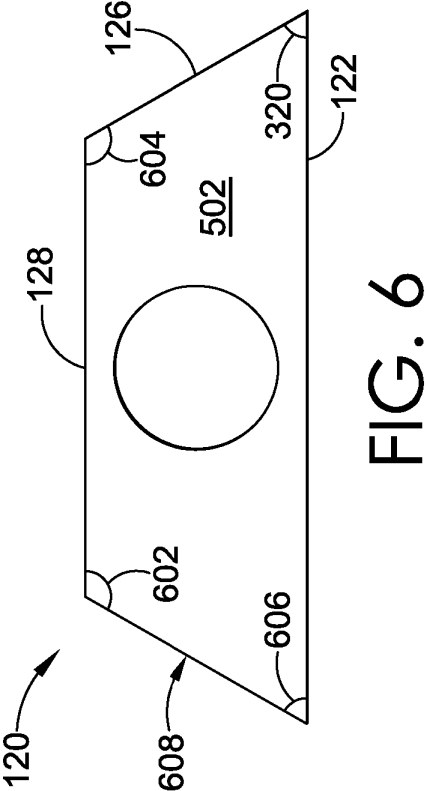


FIG. 4



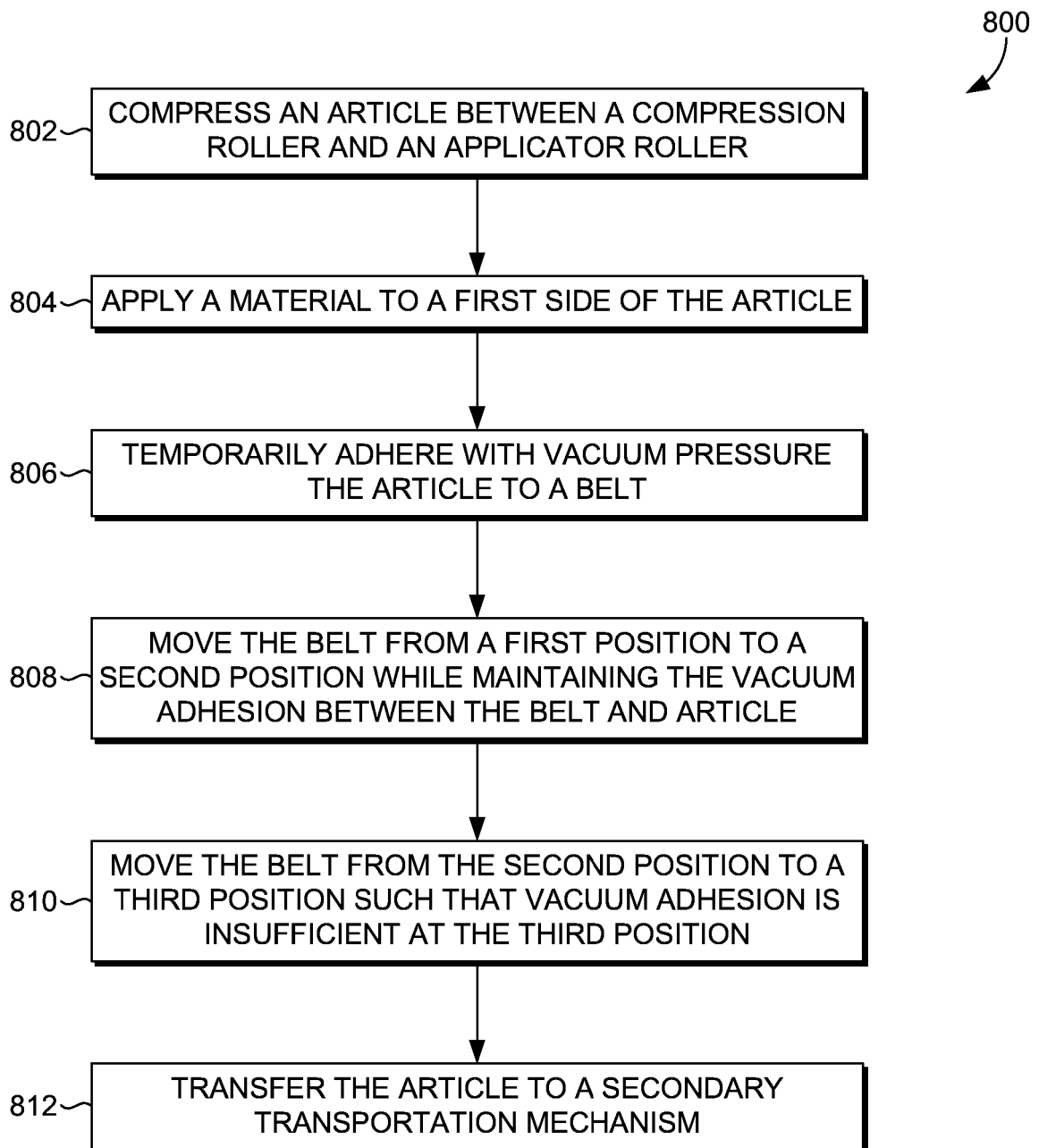


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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